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ABSTRACT

These four learning guides are self-instructional packets for four tasks identified as essential for performance on an entry-level job in mechanical drafting. Each guide is based on a terminal performance objective (task) and 2-4 enabling objectives. For each enabling objective, some or all of these materials may be presented: learning steps (outline of student activities) with necessary resources/materials cited, instruction sheet(s), and self-check with answer key. A performance test and/or a written test (with answer key) concludes each guide. Tasks covered in these guides include recognizing safe practices, constructing regular polygons and ellipses, and developing drawings for the pattern shop and the machine shop. (YLB)

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Mechanical Drafting

STUDENT LEARNING GUIDES

A-03 Recognize Safe Practices Used in Drafting
B-05 Construct Regular Polygons
B-06 Construct Ellipses
F-03 Develop Drawings for the Pattern Shop and the Machine Shop

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IN-9253-A-03

DRAFTING

A STUDENT LEARNING GUIDE

TASK:	Recognize Safe Practices Used in Drafting
DUTY:	Defining Orientation and Safety in Drafting

PURPOSE:

Safety of the individual employee is a major concern of business and industry. Every office and work station contains hazards created by the location and type of equipment used. Personal injury and damage to equipment can result from lack of attention and carelessness in any type of work situation.

This Learning Guide will provide instruction in applying safe practices in drafting.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9253	A	03	A-02

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN:

YOU WILL: recognize safe practices used in drafting.

HOW WELL: You must successfully complete the Written Test.

NOTE:

IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Recognize safe practices used in drafting.
2. Acquire safety practices when using drafting equipment.

DEPT.	PROG.	DUTY	TASK
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ENABLING OBJECTIVE NO. 1

RVTC

Recognize safe practices used in drafting.

LEARNING STEPS

1. Read Resource No. 1 to recognize safe practices used in drafting.
2. Observe your work station for possible safety hazards.

   Have instructor check your work station.
3. Check your knowledge by completing the Self-Check.
4. Go on to Enabling Objective No. 2.

RESOURCES

1. Instruction Sheet enclosed, Safe Practices Used in Drafting
2. a. Work station
   b. Instructor
3. Self-Check enclosed.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9253	A	03	1

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INSTRUCTION SHEET

RVTC

Safe Practices Used in Drafting

1. To prevent personal injury and equipment damage, every person in the drafting room must practice safe conduct and consideration for co-workers.
2. Each drafter should remain at their own work station as much as possible.
3. A draftsperson should ask for assistance in reaching a distant object instead of standing on a drafting stool to reach the object.
4. There is no place in a drafting room for "horseplay".
5. Every draftperson should close cabinet drawers and doors when they are through using the cabinet.
6. Drafters should sit erect at their drafting boards with all legs of their drafting stools firmly on the floor.
7. Each individual must understand the instructions for operating reproduction equipment before attempting to use it.
8. The draftsperson should understand how to adjust drafting boards and stools according to the manufacturer's instructions.

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IN	9253	A	03	1

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SELF-CHECK

RVTC

Directions

Check your knowledge by matching the items below on a separate sheet of paper.

1. There is no place in the drafting room for this.
2. Each individual must understand the instructions for operating this item before attempting to use it.
3. To prevent personal injury and equipment damage every person in tne drafting room must practice this.
4. Each drafter should remain here as much as possible.
5. The draftsperson should understand how to adjust these according to the manufacturer's instructions.

a. safe practices and consideration for co-workers
b. drafting boards and stools
c. horseplay
d. cabinet doors
e. personal property
f. their own work station
g. reproduction equipment

Now check your answers with the Answer Key.

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SELF-CHECK

RVTC

Answer Key

1. c
2. g
3. a
4. f
5. b

All of your answers should agree with the answers in the Answer Key. If you missed any, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
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ENABLING OBJECTIVE NO. 2

RVTC

Acquire safety practices when using drafting equipment.

LEARNING STEPS

1. Read Resource No. 1 to acquire safety practices used when using drafting equipment.
2. Check your knowledge by completing the Self-Check.
3. When you think you can attain this task, take the Written Test.

RESOURCES

1. Instruction Sheet enclosed, Safety Practices to Follow When Using Drafting Equipment
2. Self-Check enclosed.
3. Written Test for Task A-03.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9253	A	03	2

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INSTRUCTION SHEET

RVTC

Safety Practices to Follow When Using Drafting Equipment

Drafting equipment will give many years of safe, reliable service if some safety practices are applied to its use. Listed below are practices which will provide safety for the drafter and for the instruments.

1. Plan storage space in such a way that drawing instruments are placed in a convenient, orderly arrangement at all times.
2. The points on compasses, dividers and pencils are very sharp. Use these instruments only as instructed.
3. New compasses and dividers are often stiff. Be patient and adjust them carefully. They will become more flexible with use and should not be oiled.
4. The use of all cutting instruments should receive close attention. Scissors, razor blades and paper cutters are dangerous when carelessly used.
5. Electrical cords which become damaged must not be used! Report all damaged equipment to your instructor.
6. Keep all drafting instruments away from your eyes and mouth. Holding drafting instruments in your mouth is not only dangerous, it is also unsanitary.
7. When drafting machines are not being used, both drafting machine scales must be flat on the drawing board surface.
8. T squares are to be used only as straightedges for drawing horizontal lines. When not in use, they may be hung in appropriate areas.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	A	03	2

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SELF-CHECK

RVTC

Directions

Check your knowledge by matching the items below on a separate sheet of paper.

1. These instruments are often stiff when new and require patience when first being used.
2. This should be reported to your instructor.
3. When this instrument is not being used, both scales must be flat on the drawing board surface.
4. The points on these instruments are very sharp.
5. These instruments are to be used only as straightedges for drawing horizontal lines.

a. damaged equipment
b. compasses, dividers and pencils
c. storage space
d. T squares
e. razor blades
f. drafting machine
g. compasses and dividers

Now check your answers with the Answer Key.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	A	03	2

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SELF-CHECK

RVTC

Answer Key

1. g
2. a
3. f
4. b
5. d

All of your answers should agree with the answers in the Answer Key. If you missed any, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	A	03	2

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WRITTEN TEST FOR TASK NO. A-03

RVTC

TASK:	Recognize Safe Practices Used in Drafting

IN-9253-A-03

Directions

The purpose of this test is to determine if you fully understand how to recognize safe practices used in drafting. To successfully complete this test, all items must be answered correctly. For those items missed, see your instructor for a review, additional learning activities or retesting.

The items below are Multiple Choice. On the separate Answer Sheet, put the letter of the correct answer in the blank to the left of the number of the question.

DO NOT MARK ON THIS TEST!

Multiple Choice questions

1. To prevent personal injury and equipment damage, every person in the drafting room must practice:
   a. using drafting instruments as home.
   b. instructions for using reproduction equipment.
   c. safe practices and consideration for co-workers.
   d. adjusting drafting boards and stools.

2. Storage space should be planned in such a way that:
   a. other students are not inconvenienced.
   b. drawing instruments are placed in a convenient, orderly arrangement.
   c. the instructor can find your drawing instruments.
   d. other students can use your drawing instruments.

3. Electrical cords which become damaged must be:
   a. reported to your instructor.
   b. repaired by your instructor.
   c. disconnected by your instructor.
   d. thrown away by your instructor.

DEPT.	PROG.	DUTY	TASK
IN	9253	A	03

cont.

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WRITTEN TEST FOR TASK NO. A-03

RVTC

TASK:	Recognize Safe Practices Used in Drafting

IN-9253-A-03

4. There is no place in the drafting room for:
   a. consideration.
   b. horseplay.
   c. courtesy.
   d. ambition.

5. New compasses and dividers that are stiff should be:
   a. oiled carefully.
   b. dropped carefully.
   c. adjusted carefully.
   d. stored carefully.

6. Compasses, dividers and pencils:
   a. should be replaced often.
   b. are easily lost.
   c. should never be loaned.
   d. have sharp points.

7. T squares are to be used:
   a. as a means to reach distant objects.
   b. as hammers to repair other equipment.
   c. as straightedges for drawing vertical lines.
   d. as straightedges for drawing horizontal lines.

8. Drafters should sit erect at their drawing boards:
   a. with all feet of their drafting stools firmly on the floor.
   b. whenever they are receiving assistance with a drawing.
   c. when they are drawing with ink.
   d. ten minutes before the end of the class period.

9. As much as possible, each drafter should remain:
   a. at the instructor's desk.
   b. at the library.
   c. at their work station.
   d. in the instructor's office.

10. All drafting instruments should be kept away from:
    a. lockers.
    b. eyes and mouth.
    c. the drawing board surface.
    d. other students.

DEPT.	PROG.	DUTY	TASK
IN	9253	A	03

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WRITTEN TEST FOR TASK NO. A-03

RVTC

TASK:	Recognize Safe Practices Used in Drafting

ANSWER KEY

Multiple Choice questions

c 1.	d 6.	___ 11.	___ 16.	___ 21.
b 2.	d 7.	___ 12.	___ 17.	___ 22.
a 3.	a 8.	___ 13.	___ 18.	___ 23.
b 4.	c 9.	___ 14.	___ 19.	___ 24.
c 5.	b 10.	___ 15.	___ 20.	___ 25.

True-False questions

T F 1.	T F 6.	T F 11.	T F 16.	T F 21.
T F 2.	T F 7.	T F 12.	T F 17.	T F 22.
T F 3.	T F 8.	T F 13.	T F 18.	T F 23.
T F 4.	T F 9.	T F 14.	T F 19.	T F 24.
T F 5.	T F 10.	T F 15.	T F 20.	T F 25.

Matching questions

___ 1.	___ 6.	___ 11.	___ 16.	___ 21.
___ 2.	___ 7.	___ 12.	___ 17.	___ 22.
___ 3.	___ 8.	___ 13.	___ 18.	___ 23.
___ 4.	___ 9.	___ 14.	___ 19.	___ 24.
___ 5.	___ 10.	___ 15.	___ 20.	___ 25.

DEPT.	PROG.	DUTY	TASK
IN	9253	A	03

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IN-9253-B-05

DRAFTING

A STUDENT LEARNING GUIDE

TASK:	Construct Regular Polygons
DUTY:	Defining Drafting and Lettering

PURPOSE:

Regular polygons are geometric figures that often appear in the design of mechanical objects. This Learning Guide will provide instruction in developing regular polygons.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9253	B	05	B-04

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: dimensions for various polygons,

YOU WILL: construct regular polygons.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 10.

NOTE:

IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Construct a square.
2. Construct a regular pentagon.
3. Construct a regular hexagon.
4. Construct a regular octagon.

DEPT.	PROG.	DUTY	TASK
IN	9253	B	05

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ENABLING OBJECTIVE NO. 1

RVTC

Construct a square.

LEARNING STEPS

1. Read Resource No. 1 to identify steps in constructing a square.
2. Construct six full size squares given in Resource No. 2 by following the steps in Resource No. 1.
3. Evaluate your work using the Self-Check.
4. Have instructor check your work.
5. Go on to Enabling Objective No. 2.

RESOURCES

1. Text: Fundamentals of Engineering Drawing; Chapter 3, page 50, Section 3.16.
2. a. A-size vellum
   b. Given side -- AB = 5½"
   c. Given side -- AB = 6 3/4"
   d. Given diagonal length, EF = 7½"
   e. Given diagonal length, EF = 5 7/8"
   f. Given inscribed circle -- 4 7/8" diameter
   g. Given inscribed circle -- 6 13/16" diameter
3. Self-Check enclosed.
4. Instructor

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	B	05	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

	YES	NO
Construct Squares from the Given Side		
1. Were perpendicular lines drawn through points A and B?	___	___
2. Was a 45° line drawn from A to intersect the perpendicular line from B?	___	___
3. Was CD drawn parallel to AB?	___	___
Construct Squares from the Given Diagonal		
4. Were lines drawn through E and F at an angle of 45° to complete the squares?	___	___
Construct Squares from the Given Inscribed Circle		
5. Were the sides of the squares drawn tangent to the circles with a 45° triangle?	___	___
All Squares		
6. Were all sides of the same square equal to each other?	___	___
7. Were squares completed with uniform visible outlines?	___	___
8. Were standard borders and title blocks included?	___	___
9. Were squares drawn to given scale, ± 1/32"?	___	___

If you received a "no" response for any item, go back and repeat one or mroe of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	B	05	1

ENABLING OBJECTIVE NO. 2

RVTC

Construct a regular pentagon.

LEARNING STEPS

1. Read Resource No. 1 to identify steps in constructing a regular pentagon.
2. Construct two full-size pentagons in Resource No. 2 by following the steps in Resource No. 1.
   *Letter all lines and points the same as in the example.
3. Evaluate your work using the Self-Check.
4. Have instructor check your work.
5. Go on to Enabling Objective No. 3.

RESOURCES

1. Text: Fundamentals of Engineering Drawing; Chapter 3, pages 50-51, Section 3.17 and Section 3.20.
2. a. A-size vellum
   b. Given circumscribing circle = 4¼" diameter
   c. Given side = 2 3/4"
3. Self-Check enclosed.
4. Instructor

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9253	B	05	2

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

	YES	NO
Construct a Pentagon from a Given Circumscribing Circle		
1. Were all lines and points lettered as in the example?	___	___
2. Was OE equal to EB?	___	___
3. Did radius CF = EC?	___	___
4. Did side CG = radius CF?	___	___
Construct a Pentagon from a Given Side		
5. Was a semicircle drawn with a radius equal to the length of the given side?	___	___
6. Was the semicircle divided into five equal parts?	___	___
7. Were radial lines drawn through the division points?	___	___
8. Was the polygon completed by drawing arcs as indicated in the figure?	___	___
Both Pentagons		
9. Were all sides of the same pentagon equal to each other?	___	___
10. Were pentagons completed with uniform visible outlines?	___	___
11. Were standard borders and title blocks included?	___	___
12. Were pentagons drawn to given scale ± 1/32"?	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	B	05	2

ENABLING OBJECTIVE NO. 3

RVTC

Construct a regular hexagon.

LEARNING STEPS

1. Read Resource No. 1 to identify steps in constructing a regular hexagon.
2. Construct three full-size hexagons given in Resource No. 2 by following the steps in Resource No. 1.
3. Evaluate your work using the Self-Check.
4. Have instructor check your work.
5. Go on to Enabling Objective No. 4.

RESOURCES

1. Text: Fundamentals of Engineering Drawing; Chapter 3, pages 50-51, Section 3.18.
2. a. A-size vellum
   b. Distance AB across corners= 5 1/8" using arcs
   c. Distance AB across corners= 4 3/8" using 30° - 60° triangle
   d. Distance across flats = 5 5/8"
3. Self-Check enclosed.
4. Instructor

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9253	B	05	3

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

	YES	NO
Distance AB Across Corners (A)= 5 1/8"		
1. Was a circle drawn having AB as a diameter?	___	___
2. Was the radius of the circle used to draw arcs from A and B to intersect the circumference?	___	___
Distance AB Across Corners (B) = 4 3/8"		
3. Was the 30° angle of the triangle used to draw construction lines from A and B?	___	___
4. Was the 60° angle of the 30°-60° triangle used to complete the sides from A and B?	___	___
Distance Across Flats = 5 5/8"		
5. Was a circle drawn having the same diameter as the given distance across flats?	___	___
6. Were tangents drawn to the circle with the 30°-60° triangle to form the sides of the hexagon?	___	___
All Hexagons		
7. Were all sides of the same hexagon equal to each other?	___	___
8. Were hexagons completed with uniform visible outlines?	___	___
9. Were standard borders and title blocks included?	___	___
10. Were hexagons drawn to given scale ± 1/32"?	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	B	05	3

ENABLING OBJECTIVE NO. 4

RVTC

Construct a regular octagon.

LEARNING STEPS

1. Read Resource No. 1 to identify steps in constructing a regular octagon.
2. Construct four full-size octagons in Resource No. 2 by following the steps in Resource No. 1.
3. Evaluate your work using the Self-Check.
4. Have instructor check your work.
5. When you think you can perform this task, take the Performance Test.

RESOURCES

1. Text: Fundamentals of Engineering Drawing; Chapter 3, page 51, Section 3.19.
2. a. A-size vellum
   b. Distance across flats = 2 5/8" diagonal method
   c. Distance across flats = 3 11/16" diagonal method
   d. Distance across flats = 4 1/8" inscribed circle method
   e. Distance across flats = 3 3/16" inscribed circle method
3. Self-Check enclosed.
4. Instructor
5. Performance Test for Task B-05.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9253	B	05	4

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

	YES	NO
Construct a Regular Octagon from a Circumscribed Square		
1. Were squares drawn equal to the given distance across flats?	___	___
2. Were diagonals drawn within the squares?	___	___
3. Were corners of the squares used as centers for radii equal to one-half the diagonals?	___	___
Construct a Regular Octagon from an Inscribed Circle		
4. Were circles drawn equal to the given distance across flats?	___	___
5. Were the sides of the octagon drawn tangent to the inscribed circle by using a straightedge and a 45° triangle?	___	___
All Octagons		
6. Were all sides of the same octagon equal to each other?	___	___
7. Were octagons completed with uniform, visible outlines?	___	___
8. Were standard borders and title blocks included?	___	___
9. Were octagons drawn to given dimensions ± 1/32"?	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	B	05	4

PERFORMANCE TEST FOR TASK NO. B-05 RVTC

TASK:	Construct Regular Polygons

IN-9253-B-05

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given dimensions for various polygons, you will construct the following regular polygons in full size. Divide a "C" size sheet of vellum into four equal sections. Letter lines and points as in the practice problems.

Section 1. A square from a diagonal: the diagonal length EF = 5"

Section 2. A pentagon from a circumscribing circle: the diameter of circle = 5".

Section 3. A hexagon inscribed in a circle: the distance across corners = 5".

Section 4. An octagon from a circumscribed square: the distance across flats = 5". This fourth section will include the standard title block.

Based upon the items below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
	A Square from a Diagonal		
1.	Was diagonal length drawn to the given size ± 1/32"?		
2.	Were lines drawn through E and F at an angle of 45° to complete the square?		
3.	Were all sides of the square equal?		
	A Pentagon from a Circumscribing Circle		
4.	Was diameter of the circle drawn to given size ± 1/32"?		
5.	Was OE equal to EB?		
6.	Did radius CF = EC?		
7.	Did side CG = radius CG?		
8.	Were all sides of the pentagon equal?		

☐ ATTAINED

Score _____ ☐ NOT ATTAINED EVALUATOR'S SIGNATURE _____

DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9253	B	05		Page 1 of 2

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PERFORMANCE TEST FOR TASK NO. B-05

CONT.

ITEM NO.	ITEMS TO BE EVALUATED (CONT.):	YES	NO
	A Hexagon Inscribed in a Circle		
9.	Was a circle drawn having given distance across corners as the diameter ± 1/32"?		
10.	Was the radius of the circle used to draw arcs from A and B to intersect the circumference?		
11.	Were all sides of the hexagon equal?		
	An Octagon from a Circumscribed Square		
12.	Was square drawn equal to the given distance across flats ± 1/32"?		
13.	Were diagonals drawn within the square?		
14.	Were corners of the square used as centers for radii equal to one-half the diagonals?		
15.	Were all sides of the octagon equal?		
	General		
16.	Were standard border lines included?		
17.	Was standard title block included?		
18.	Were all construction lines drawn very light and accurate?		
19.	Were all figures completed with a uniform visible outline?		
20.	Did lettering conform to acceptable standards?		
21.	Were all lines and points lettered as directed?		
22.	Were erasures kept to a minimum and done very neatly?		

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DRAFTING

A STUDENT LEARNING GUIDE

TASK:	Construct Ellipses
DUTY:	Defining Drafting and Lettering

PURPOSE:

The layout and design of many mechanical and structural objects require the accurate construction of elliptical figures. This Learning Guide will provide instruction in the construction of ellipses with the use of the French curve and compass.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9253	B	06	B-05

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: dimensions and methods to be used in the construction of ellipses,

YOU WILL: construct ellipses.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 12.

NOTE:

IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Construct an ellipse using the concentric circle method.
2. Construct an ellipse using the parallelogram method.
3. Construct an ellipse using the four-center method.

DEPT.	PROG.	DUTY	TASK
IN	9253	B	06

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ENABLING OBJECTIVE NO. 1

RVTC

Construct an ellipse using the concentric circle method.

LEARNING STEPS

1. Read Resource No. 1 to identify construction of an ellipse by the concentric circle method.
2. Read and listen to Resource No. 2 for instructions in using the French curve to draw an ellipse.
3. Draw an ellipse using Resource No. 3.
4. Evaluate your work using the Self-Check.
5. Go on to Enabling Objective No. 2.

RESOURCES

1. Text: Fundamentals of Engineering Drawing; Chapter 3, page 57, Section 3.42.
2. Sound page: Use the French Curve to Construct an Ellipse
3. a. A-size Vellum
   b. Instruction Sheet enclosed, Directions for Drawing an Ellipse by the Concentric Circle Method
4. Self-Check enclosed.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9253	B	06	1

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INSTRUCTION SHEET

RVTC

Directions for Drawing an Ellipse by the Concentric Circle Method

1. Major axis = 6"; Minor axis = 4"
2. Circles are to be divided into same number of parts as in Figure 3.40 in Chapter 3, page 57 of text.
3. All points are to be labeled the same as in Figure 3.40.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	B	06	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

		YES	NO
1.	Was the large circle drawn with a 6" diameter?	___	___
2.	Was the small circle drawn with a 4" diameter?	___	___
3.	Were the circles divided into 24 equal central angles?	___	___
4.	Were construction lines drawn parallel to the minor axis from the division points on the circumference of the large circle?	___	___
5.	Were construction lines drawn parallel to the major axis from the division points on the circumference of the small circle?	___	___
6.	Did the intersections of these lines form points used to construct the ellipse?	___	___
7.	Was the ellipse completed with a smooth, dark visible outline?	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	B	06	1

ENABLING OBJECTIVE NO. 2

RVTC

Construct an ellipse using the parallelogram method.

LEARNING STEPS

1. Read Resource No. 1 to identify construction of an ellipse by the parallelogram method.
2. Draw an ellipse using Resource No. 2.
3. Evaluate your work using the Self-Check.
4. Go on to Enabling Objective No. 3.

RESOURCES

1. Text: Fundamentals of Engineering Drawing; Chapter 3, page 57, Section 3.44.
2. a. A-size Vellum
   b. Instruction Sheet enclosed, Directions for Drawing an Ellipse by the Parallelogram Method
3. Self-Check enclosed.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	B	06	2

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INSTRUCTION SHEET

RVTC

Directions for Drawing an Ellipse by the Parallelogram Method

1. Major axis = 5"; Minor axis = 3"
2. All points are to be labeled the same as in Figure 3.42 in Chapter 3, page 57 of text.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	B	06	2

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

		YES	NO
1.	Was the width of the parallelogram drawn 5" (± 1/32)?	___	___
2.	Was the height of the parallelogram drawn 3" (± 1/32)?	___	___
3.	Were lines and points labeled as in the figure?	___	___
4.	Were AO and AE divided into the same number of equal parts?	___	___
5.	Did intersections of the construction lines form points on the ellipse?	___	___
6.	Was the ellipse completed with a smooth, dark visible outline?	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	B	06	2

ENABLING OBJECTIVE NO. 3

RVTC

Construct an ellipse using the four-center method.

LEARNING STEPS

1. Read Resource No. 1 to identify construction of an ellipse by the four-center method.
2. Draw an ellipse using Resource No. 2.
3. Evaluate your work using the Self-Check.
4. Have instructor evaluate all your work.
5. When you think you can perform this task, take the Performance Test.

RESOURCES

1. Text: Fundamentals of Engineering Drawing; Chapter 3, page 57, Section 3.43.
2. a. A-size Vellum
   b. Instruction Sheet enclosed, Directions for Drawing an Ellipse by the Four-Center Method
3. Self-Check enclosed.
4. a. Completed drawings
   b. Instructor
5. Performance Test for task B-06

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9253	B	06	3

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INSTRUCTION SHEET

RVTC

Directions for Drawing an Ellipse by the Four-Center Method

1. Major axis = 5½"; Minor axis = 3½"
2. Label lines and points the same as they are labeled in Figure 3.41 in Chapter 3, page 57 of text.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	B	06	3

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

	YES	NO
1. Was the major axis drawn 5½" (± 1/32")?	___	___
2. Was the minor axis drawn 3½" (± 1/32")?	___	___
3. Were the lines and points labeled as shown in the figure?	___	___
4. Was the perpendicular bisector drawn so that A-F was equally divided?	___	___
5. Were the large arcs drawn between the tangent points without overlapping the small arcs?	___	___
6. Were the small arcs drawn between the tangent points without overlapping the large arcs?	___	___
7. Was the ellipse completed with a dark, uniform visible outline?	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	B	06	3

PERFORMANCE TEST FOR TASK NO. B-06 RVTC

TASK:	Construct Ellipses

IN-9253-B-06

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given dimensions and methods used in the construction of ellipses, you will construct the following ellipses in full scale. Divide a "C" size sheet of vellum into four sections.

Section 1. Concentric Circle Method: Major axis = 7", Minor axis = 4"
Section 2. Parallelogran Method: Major axis = 7", Minor axis = 4"
Section 3. Four-Center Method: Major axis = 7", Minor axis = 4"
Section 4. An ellipse drawn by any of the above methods: Major axis = 4½", Minor axis = 3". This fourth section will include the standard title block.

Based on the items below, your instructor's evaluation will determine if you are competent in this task.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
	Ellipse by the Concentric Circle Method		
1.	Was the large circle drawn with the stated major axis used as the diameter (± 1/32")?		
2.	Was the small circle drawn with the stated minor axis used as the diameter (± 1/32")?		
3.	Were circles divided into a convenient number of equal central angles?		
4.	Were construction lines drawn parallel to the minor axis from the division points on the circumference of the large circle?		
5.	Were construction lines drawn parallel to the major axis from the division points on the circumference of the small circle?		
6.	Did the intersections of these lines form points used to construct the ellipse?		
7.	Was the ellipse completed with a smooth, dark outline?		

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DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9253	3	06		Page 1 of 2

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PERFORMANCE TEST FOR TASK NO. B-06

CONT.

ITEM NO.	ITEMS TO BE EVALUATED (CONT.):	YES	NO
	Ellipse by the Parallelogram Method		
8.	Was the width of the parallelogram drawn the same size as the stated major axis (± 1/32")?		
9.	Was the height of the parallelogram drawn the same size as the stated minor axis (± 1/32")?		
10.	Were lines and points labeled the same as required?		
11.	Were AO and AE divided into the same number of equal parts?		
12.	Did intersections of the construction lines form points on the ellipse?		
13.	Was the ellipse completed with a dark, uniform visible outline?		
	Ellipse by the Four-Center Method		
14.	Were both the major and minor axes drawn to the stated size (± 1/32")?		
15.	Were the lines and points labeled as required?		
16.	Was the perpendicular bisector drawn so that A-F was equally divided?		
17.	Were the arcs forming the ellipse drawn smoothly tangent to each other?		
18.	Was the ellipse completed with a dark, uniform visible outline?		
	Ellipse by Any of the Methods Above		
19.	Was the ellipse constructed in accord with all of the items to be evaluated for the other ellipse of the same method?		

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7700 State Road 544 N
Winter Haven, Florida 33880

IN-9253-F-03

DRAFTING

A STUDENT LEARNING GUIDE

TASK:	Develop Drawings for the Pattern Shop and the Machine Shop
DUTY:	Producing Working Drawings

PURPOSE:

A mechanical drawing is reproduced into a blueprint which is sent to various shops. Skilled shopworkers use the blueprint to make the part shown on the print. This Learning Guide will provide instruction in developing drawings for the pattern shop and the machine shop. A knowledge of shop methods will enable the drafter to produce drawings of machine parts that will function according to their design.

DEPT.	PROG.	DUTY	TASK	PRE REQ.
IN	9253	F	03	F-02

REVISED				

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STUDENT PERFORMANCE OBJECTIVES: RVTC

TERMINAL PERFORMANCE OBJECTIVE:

GIVEN: an isometric sketch of a casting,

YOU WILL: develop drawings for the pattern shop and the machine shop.

HOW WELL: Your performance will be assessed by your instructor using the Performance Test on page 9.

NOTE:

IF YOU THINK YOU CAN ALREADY PERFORM THIS TASK TO THE LEVEL INDICATED IN THE TERMINAL PERFORMANCE OBJECTIVE ABOVE, SEE YOUR INSTRUCTOR.

ENABLING OBJECTIVES:

1. Develop drawings for the pattern shop.
2. Develop drawings for the machine shop.
3. Develop drawings for both the pattern shop and machine shop.

DEPT.	PROG.	DUTY	TASK
IN	9253	F	03

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ENABLING OBJECTIVE NO. 1

RVTC

Develop drawings for the pattern shop.

LEARNING STEPS

1. Read Resource No. 1 to identify methods used by the pattern shop.
2. View Resource No. 2 to identify steps in developing drawings for the pattern shop.
3. Read and view Resource No. 3 for an overall picture of a drawing used for the pattern shop.
4. Develop full scale drawi for the pattern shop usi Resource No. 4.
5. Evaluate your work using the Self-Check.
6. Have instructor check your work.
7. Go on to Enabling Objective No. 2.

RESOURCES

1. Text: Engineering Drawing and Graphic Technology; Chapter 9, pages 326-330, Sections 1 - 9.
2. Caramate slide series: "Developing Drawings for the Pattern Shop"
3. Text: Engineering Drawing and Graphic Technology; Chapter 10, pages 390-391, Section 85 - Figure 107.
4. Text: Engineering Drawing and Graphic Technology; Chapter 5, page 184, problem 29 and page 185, problem 40.
5. Self-Check enclosed.
6. Instructor

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9253	F	03	1

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

		YES	NO
1.	Did dimensions allow for additional metal on all surfaces that will be machined?	___	___
2.	Were finish marks omitted?	___	___
3.	Were machined holes omitted?	___	___
4.	Were fillets and rounds noted?	___	___
5.	Were linework and lettering made according to approved standards?	___	___
6.	Were standard borders and title block included?	___	___
7.	Was vellum size chosen in proportion to the size of the object?	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	F	03	1

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ENABLING OBJECTIVE NO. 2

RVTC

Develop drawings for the machine shop.

LEARNING STEPS

1. Read Resource No. 1 to identify methods used by the machine shop.
2. View Resource No. 2 to identify steps in developing drawings for the machine shop.
3. Read and view Resource No. 3 for an overall picture of a drawing used for the machine shop.
4. Develop full scale drawings for the machine shop using Resource No. 4.
5. Evaluate your work using the Self-Check.
6. Have instructor check your work.
7. Go on to Enabling Objective No. 3.

RESOURCES

1. Text: Engineering Drawing and Graphic Technology; Chapter 9, pages 330-339, Sections 10 - 29
2. Caramate slide series: "Developing Drawings for the Machine Shop"
3. Text: Engineering Drawing and Graphic Technology; Chapter 10, page 391.
4. Text: Engineering Drawing and Graphic Technology; Chapter 5, page 184, problem 29 and page 185, problem 40.
5. Self-Check enclosed.
6. Instructor

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9253	F	03	2

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

	YES	NO
1. Were dimensions located from carefully chosen starting points in all three directions?	___	___
2. Were critical dimensions given between surfaces to be machined and/or center lines?	___	___
3. Were finish marks shown on surfaces to be machined?	___	___
4. Was fillet and round note omitted?	___	___
5. Were linework and lettering made according to approved standards?	___	___
6. Were standard border and title block included?	___	___
7. Was vellum size chosen in proportion to the size of the object?	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	F	03	2

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ENABLING OBJECTIVE NO. 3

RVTC

Develop drawings for both the pattern shop and machine shop.

LEARNING STEPS

1. Read Resource No. 1 to identify drawings for both the pattern shop and machine shop.
2. Develop full scale drawings for the pattern shop and the machine shop using Resource No. 2.
3. Evaluate your work using the Self-Check.
4. Have instructor check your work.
5. When you think you can perform this task, take the Performance Test.

RESOURCES

1. Text: Engineering Drawing and Graphic Technology; Chapter 10, page 392, Figure 109.
2. Text: Engineering Drawing and Graphic Technology; Chapter 5, page 184, problem 29 and page 185, problem 40.
3. Self-Check enclosed.
4. Instructor
5. Performance Test for Task F-03.

DEPT.	PROG.	DUTY	TASK	EN.OBJ.
IN	9253	F	03	3

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SELF-CHECK

RVTC

Directions

Evaluate your work by answering the items below.

All items should receive a "yes" response.

		YES	NO
1.	Did the drawing show the actual size of the completed object?	___	___
2.	Were finish marks shown on surfaces to be machined?	___	___
3.	Were fillets and rounds noted?	___	___
4.	Were all holes drawn and dimensioned?	___	___
5.	Were dimensions located from carefully chosen starting points in all three principal directions?	___	___
6.	Were critical dimensions given between surfaces to be machined and/or center lines?	___	___
7.	Was over-dimensioning avoided?	___	___
8.	Were linework and lettering made according to approved standards?	___	___
9.	Were standard border and title block included?	___	___
10.	Was vellum size chosen in proportion to the size of the object?	___	___

If you received a "no" response for any item, go back and repeat one or more of the Learning Steps for this Enabling Objective.

DEPT.	PROG.	DUTY	TASK	EN. OBJ.
IN	9253	F	03	3

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PERFORMANCE TEST FOR TASK NO. F-03 RVTC

TASK:	Develop Drawings for the Pattern Shop and Machine Shop

IN-9253-F-03

STUDENT'S NAME _____ DATE _____

DIRECTIONS TO STUDENT: Given an isometric sketch of a casting, you will develop drawings for the pattern shop, machine shop and for both the pattern shop and machine shop. The drawings are to be drawn full scale.
Based upon the items below, your instructor's evaluation will determine if you are competent in this task.
The required problec is: Text: Engineering Drawing and Graphic Technology; Chapter 5, page 189, problem 77.

ITEM NO.	ITEMS TO BE EVALUATED For successful attainment ALL items must receive a "YES" response	YES	NO
	Drawing for the Pattern Shop		
1.	Did dimensions allow for additional metal on all surfaces that will machined?		
2.	Were fillets and rounds noted?		
3.	Were finish marks omitted?		
4.	Were machined holes omitted?		
	Drawing for the Machine Shop		
5.	Were dimensions located from carefully chosen starting points in all three principal directions?		
6.	Were critical dimensions given between surfaces to be machined and/or center lines?		
7.	Were finish marks shown on the surfaces to be machined?		
8.	Was fillet and round note omitted?		

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DEPT.	PROG.	DUTY	TASK	ATTEMPT	
IN	9253	F	03		Page 1 of 2

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PERFORMANCE TEST FOR TASK NO. F-03

CONT.

ITEM NO.	ITEMS TO BE EVALUATED (CONT.):	YES	NO
	Drawings for Both the Pattern Shop and Machine Shop		
9.	Did the drawing show the actual size of the completed object?		
10.	Were finish marks shown on surfaces to be machined?		
11.	Were fillets and rounds noted?		
12.	Were all holes drawn and dimensioned?		
13.	Were dimensions located from carefully chosen starting points in all three principal directions?		
14.	Were critical dimensions given between surfaces to be machined and/or center lines?		
15.	Was over-dimensioning avoided?		
	All Drawings		
16.	Was vellum size chosen in proportion to the size of the drawing of the object?		
17.	Was linework and lettering made according to approved standards?		
18.	Were all dimensions drawn to scale ± 1/32"?		
19.	Were standard borders included?		
20.	Did title block include standard information?		

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